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PRICE ELASTICITIES OF DEMAND FOR NONDURABLE GOODS, WITH EMPHASIS ON FOOD

by

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PRICE ELASTICITIES OF DEMAND FOR NONDURABLE GOODS

I have approached the preparation of this paper with some reluctance because, as I told our program chairman over a year ago, I do not feel that the research work with which I am associated can tell us very much about the factors that influence the structure of consumption over the long-run. This research is designed primarily to measure the factors that affect prices and/or consumption from year-to-year, although in doing so we obtain estimates of such structural parameters as elasticities of demand with respect to price and sometimes with respect to consumer income or other economic variables. However, the committee in charge of the program seemed to feel that a discussion of this work would be useful, and I am always happy to take part in such a discussion.

As some of you may be no better informed about this sort of work than I am about the sort of work that you do, I first will give a simple description of just what is involved in a study of this kind. Then I will take up some conceptual and analytical problems and show to the extent possible the situations under which such analyses can shed light on how and why consumption patterns change over long periods of time. I also will discuss some related research that can shed more light on these questions. Finally I will briefly review about 200 recent statistical analyses in this general area and draw such collective conclusions as we can from them. Results from these studies are summarized in table 1.[1]

[1] This table was compiled, chiefly from original sources, by Hyman Weingarten of our staff.

Methods of Measuring the Elasticity of Demand With Respect to Price from Time Series Data

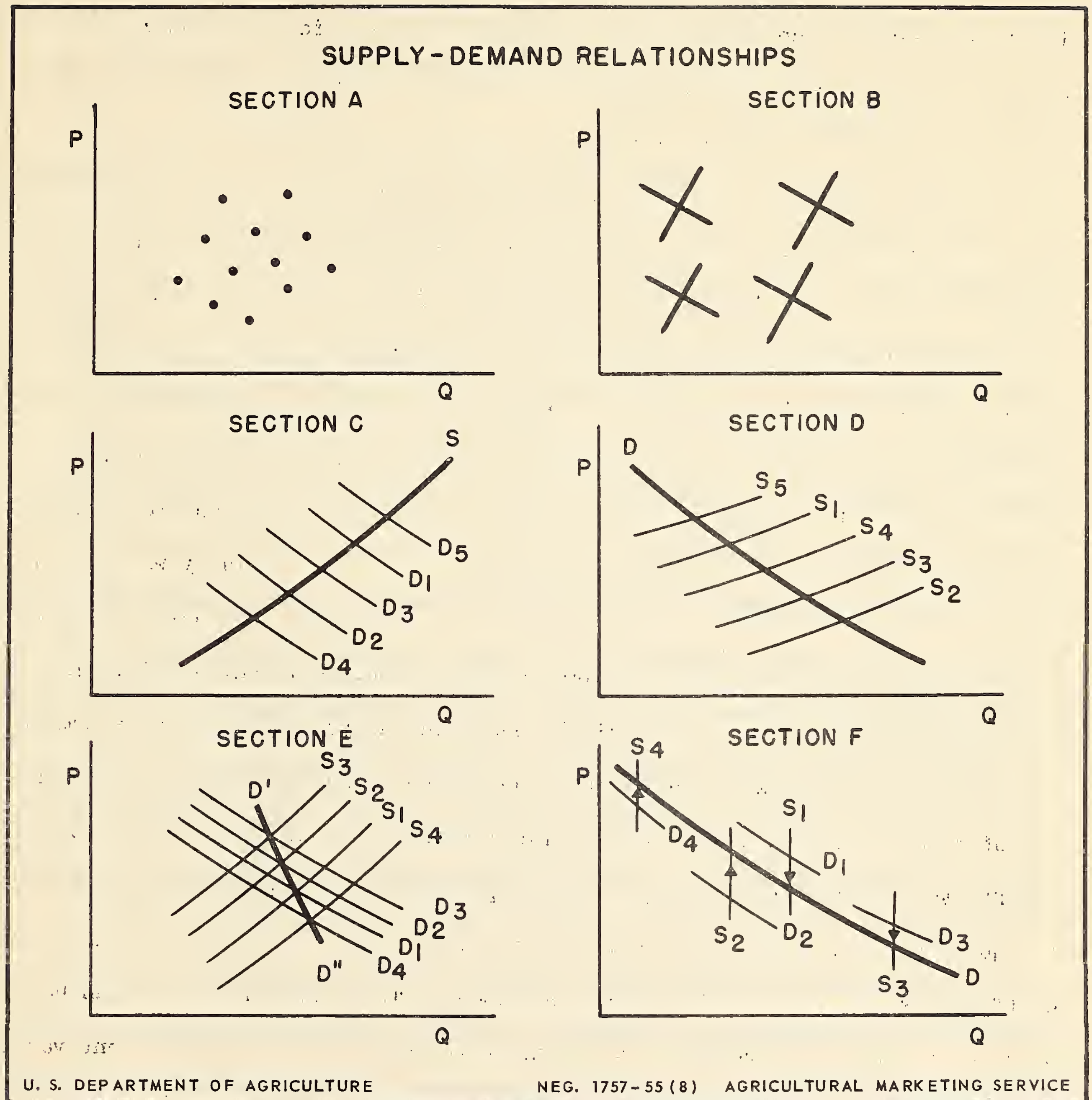
All of you are acquainted, I am sure, with the Marshallian concept of price as representing the intersection of a demand curve and a supply curve. If a research worker, when beginning a study of the factors that affect demand, plots data on consumption and price in a scatter diagram, he is confronted with

a set of dots like that shown in section A of the chart on page 3. Each of these dots can ~~be~~ thought of as the intersection of a demand curve and a supply curve, as in section B, but without further information neither curve can be determined from the data. If the demand curve has shifted over time but the supply curve has remained relatively stable, as in section C, the dots trace out a supply curve; conversely, if the supply curve has shifted but the demand curve has remained stable, as in section D, the dots trace out a demand curve. If correlated shifts for each curve have taken place, as in section E, the dots trace out what may look like a structural demand or supply curve, but with a slope that is too flat or too steep.[2]

[2] The general line of reasoning given here is included in papers by Working (33) and Koopmans (20, pp. 27-35). Underlined numbers in parentheses refer to Literature Cited, p. 19.

In many analyses of the demand for agricultural products, factors that cause the demand curve to shift over time are included as separate variables in a multiple regression equation. In effect, we are then able to derive from the estimating equation an average demand curve. This is indicated in a rough way in section F. If we assume that the quantity supplied in the market place is highly correlated with production and that production is chiefly determined by factors other than those in effect during the marketing period, then, when price is plotted on the vertical scale, the supply curve for each period is approximately a vertical line. Under these circumstances, year-to-year shifts in the supply curve trace out a demand curve, just as they did in section D. In such cases, we may be able to obtain a statistically consistent estimate of the slope of the demand curve by use of a least squares multiple regression analysis for which price is the dependent variable and supply and some demand shifters are used as independent variables.[3] Fox has shown that this approach can be used to

[3] This point was noted by Working (33, p. 223), emphasized by Ezekiel (8), and reconsidered in the light of modern simultaneous equations theory by Fox (10).


SUPPLY-DEMAND RELATIONSHIPS
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obtain estimates of the elasticity of demand with respect to price that are at least approximately consistent (in a statistical sense) for a considerable number of agricultural products, including meat, poultry and eggs, feed grains, and several fresh fruits and vegetables.

What happens if the supply curve is not a vertical line, or approximately so? If we consider any single point, we have no way of knowing on which demand and supply curve of a whole family of curves it lies. The basic problem of indeterminateness is similar to that in which correlated shifts in the demand and supply curves take place. What is needed is some hypothesis, adequately tested and proven to be sound, as to the nature of the joint relationships between supply and demand. We should then be able to untangle the two and to obtain a reliable estimate of the slope of each curve. This is essentially what is involved in the simultaneous equations approach, as set forth by Haavelmo (14). I do not want to discuss systems of simultaneous equations in any detail. The basic approach is the same as in single equation analyses except that a number of economic variables are assumed to be determined simultaneously by a common set of economic forces and by other variables that are similar to those used as "shift" variables in a least squares multiple regression equation. The system of equations is solved in such a way as to give estimates of the structural coefficients that are statistically consistent. These equations then can be used to obtain a simultaneous estimation of the several jointly-dependent variables.[4] Several of the analyses for which results are shown in table 1 are based

[4] I discuss the general nature of the fitting procedure and the circumstances under which a simultaneous equations approach is needed in "A Comparison of Single and Simultaneous Equation Techniques" to be published in the 1955 Proceedings issue, Jour. Farm Econ.

on a simultaneous equations approach.

Conceptual and Analytical Problems That Relate To the Measurement of Price Elasticities

Most economists are agreed that valid estimates of the elasticity of demand with respect to price can be obtained from statistical analyses of this sort provided appropriate statistical methods are used. Decisions relating to statistical methods that must be made include choice of (1) "shift" variables, (2) functional forms, that is, linear, logarithmic, or something else, (3) the level within the marketing system, (4) the statistical fitting procedure, that is, least squares or simultaneous equation methods, (5) needed adjustments in data, such as use of per capita or deflated figures, (6) means of allowing for changes over time, such as use of first differences or the inclusion of time as a variable, (7) needed adjustments for assumed errors in the data, and many others.[5] With all of these things about which to disagree, research analysts always can find one reason or another to condemn the results of their colleagues and to justify one more study in any given commodity field. However, in general, they agree on the basic approach; they disagree only about the details.

[5] Considerations involved in making decisions of this sort are discussed by Foote and Fox (9, pp. 1-12, 29-52.)

Elmer Working, in a recent study (34),[6] has raised some more fundamental questions. The following are his main conclusions: (1) "There is a difference between the short-run and the long-run elasticity of demand for meat ... In the short-run the demand for meat is somewhat inelastic ... The long-run demand for meat at retail is elastic." (2) "Changing price levels influence the real demand for meat". During inflation or deflation, meat prices outrun the general level of commodity prices. (3) "Demand for meat is more affected by long-continued changes in real incomes than by equal changes of shorter duration."

[6] The summary presented here is taken from Breimyer (3).

Breimyer points out that Working seems to recognize two basic, and conflicting, features of demand relationships: (1) The relatively volatile free-market behavior of farm product prices, in contrast with more inflexible and established prices for many nonfarm commodities and most services; and (2) the familiar Engel's law, which observes that a smaller percentage of consumers' incomes is spent for food at the higher than at the lower income levels. Opposing effects of the two characteristics are seen during an inflationary upswing, when the first gives an extra lift to demand for farm products, but the second is a restraining influence.

The principal new techniques suggested by Working are (1) a separate allowance for the level of real income and the general price level as variables causing shifts in the demand curve, and (2) the introduction of "dynamic" considerations by taking separate account of changes in the consumers' price index from its previous 5-year average, of differences between current and 5-year or 10-year average consumption, and of differences between current and 10-year average consumers' income. Price flexibility coefficients that relate to the 5-year or 10-year consumption histories are used in deriving his long-run coefficients of elasticity. I have not reached a firm conclusion as to whether this approach is a sound method for deriving long-run elasticities, but do feel that the separate allowances for real income and the general price level as demand shifters is an improvement over methods used in the past of either working with deflated data or using money income. Breimyer appears to hold similar views.

Several other studies that attempt to introduce dynamic considerations into analyses of demand are worthy of note. One of these is that by Foytik (11) for California plums. In his final equation, which deals with factors that affect price in a specific week, he uses as independent variables quantities in the current and preceding week, week of season, and consumer income, and allows for systematic changes in the regression coefficient on income as the season progresses. Major conclusions that relate to this phase of the study are as follows:

1. "Temporal markets are definitely interrelated--that is, current prices are affected by sales made earlier in the season as well as by sales made currently."

2. "The net price-income relation becomes materially less steep as the season advances."

3. "Price is more responsive to changes in sales during the peak of the season than earlier or later--thus demand is less elastic during midseason than for either earlier or later sales."

Lowenstein and Simon (23) use a very different approach to introduce dynamic elements into a study of factors that affect mill consumption of cotton. They allow for imbalances in mill inventories of cotton cloth by including as a variable the ratio of stocks to unfilled orders expressed in terms of deviations from a "normal" ratio. When the ratio is relatively high, a downward adjustment in output to reduce stocks is indicated. Conversely, a relatively low ratio suggests the likelihood of a higher output rate in the near future. They found that this variable, along with current and lagged consumer income, consumption of synthetic fibers, and deflated prices of cotton, explained 95 percent of the variation in cotton consumption during the years 1927-32, 1935-40, and 1948-52. These were the only years for which the stock-order ratio was available. All of the regression coefficients differed significantly from zero. An analysis for the same years but for which the stock-order ratio was omitted explained only 84 percent of the variation in cotton consumption.

In 2 additional studies, cyclical patterns were found in the unexplained residuals, and the multiple correlation coefficient was increased by a statistically significant amount by including in the regression equation a factor allowing for position within the cycle. For edible fats and oils, Armore (1, pp. 30, 57-58) used the change in price from the preceding year as a factor affecting the level of prices. The economic justification for this procedure is as follows:

When prices of these commodities rise, manufacturers and dealers tend to build up their stocks, so that the demand at the wholesale level is greater than that represented by direct movement into consumption. If such stocks have accumulated, a reverse effect takes place when prices decline. Manufacturers and dealers tend to reduce their stocks, so that demand at the wholesale level is less than that represented by direct consumption. Thus the direction in which prices are changing affects the level of prices.

Study of the unexplained residuals in an analysis of factors that affect prices of coffee by Hopp and Foote (17) indicated that in general they are positive when prices are rising or remain relatively high and they are negative when prices are declining or remain relatively low. The economic explanation of this appears to be similar to that for fats and oils. When supplies are declining, efforts are made to maintain coffee inventories, and prices tend to be higher than would be expected from the level of supply in relation to current consumption When supplies are increasing, inventories can be reduced; hence prices tend to be lower than would be expected based on relative supplies.

Several questions regarding price elasticities of demand have been raised in the correspondence leading to this paper. These include (1) Do demand functions differ among various economic groups? (2) How do demand functions change over time? (3) Do elasticity coefficients vary with the level of economic activity? Few clues regarding these are given by conventional time series analyses. Little information regarding the first is given because most analyses are based on market aggregates. Information with respect to the last two is lacking because in general, in the statistical fitting process, the assumption is made that the functions, as such, have not changed, but that the entire level of the curve shifts back and forth (or up and down) depending on the level of the various "shift" variables, including, perhaps, a time trend. If the analysis is based on logarithms, the elasticity is a direct function of the assumed constant slope of the

curve; if based on linear relations, the elasticity generally is computed at the means for the variables included in the analysis.

Some attempts have been made to determine whether demand functions differ among various economic groups by making use of data obtained from consumer panels Zwick (35) studied the effects of family size, education, age, ethnic background religion, and occupational status of the housewife on purchase behavior. Income and price elasticities were obtained for individual kinds of meat, fish, or poultry items and the aggregate of all meat, fish, and poultry items. The degree of price elasticity was independent of each of these characteristics excep age of housewife. The higher the age, the lower was the price elasticity.

George Kuznets, in a study conducted by the University of California in cooperation with the Agricultural Marketing Service, has done a great deal of work on competition among citrus products, with emphasis on frozen orange juice, using monthly consumer panel data. In a discussion of a paper of mine (22), he says, "Of the four areas singled out in Mr. Foote's paper as those in which significant advances are being made I would be inclined to rate the utilization of data from consumer panels as holding the greatest promise of obtaining valid estimates of short-run consumer demand (purchase) parameters. At least some of the old problems that beset demand analysis based on time-series aggregates (and for which there are probably no good solutions possible in terms of techniques of analysis) appear to be of lesser importance when one deals with individual consumer panel data in which variation can be observed both over time and over consumer units. For panel data to be fully usable in the measurement of direct and cross elasticities of demand it is necessary to obtain supplementary data on prices confronting panel families for items not purchased and sufficient information on panel family characteristics so that the effects on purchase behavior of these non-economic variables can be netted out. The working hypothesis is that the number of such family variables impinging

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importantly on purchase activity is not very large." Such supplementary data are not now available but steps are being taken within the Agricultural Marketing Service to obtain them in connection with studies to be made in the future.

Conceptual and Analytical Problems That Relate to the Measurement of Income Elasticities

In connection with the measurement of elasticity of demand with respect to income some economists, such as Stone (29) and Wold and Jureen (32), have argued that an accurate measurement cannot be obtained based on aggregate time series data but that these coefficients must be measured from budget data. After the elasticity of demand with respect to income has been obtained in this way, they adjust consumption for the effects of changes in real income by making use of this coefficient and then derive an estimate of elasticity of demand with respect to price by using a regression of adjusted consumption on deflated prices and other variables. Other authors, such as Fox (10), make no mention of income elasticities but merely use disposable income or a similar measure as a variable for which allowance must be made in order to derive elasticities of demand with respect to price from time series data.

The only careful study that I have seen of the relative merits of using aggregate time series or budget data or a combination of the two to derive structural coefficients that are assumed to apply to individual consumers or families is that of Klein (19, pp. 211-226, 236-240). His comments relate chiefly to the obtaining of coefficients of income elasticity since, in general, elasticities with respect to price cannot be obtained from budget data. However, in his concluding paragraphs he outlines a general model that might be used to derive any sort of structural parameters in which an economic analyst might have an interest.

With respect to the methods of Stone and Wold and Jureen, he says, "The pooling principle is admirable, of course, going in the direction of enlarging our sources of basic information. But it does not, in practice, proceed on the

basis of a systematic model showing which variables are endogenous, exogenous, or otherwise predetermined. Most applications are not properly formulated in terms of structural estimation." He then proceeds to outline a "properly formulated" model. He specifies endogenous and exogenous variables in a given time period (1) for individuals and (2) for market aggregates, with random disturbances that relate to each. He then outlines four types of equations: (1) Those that relate to economic decisions made by the individual family based on its own exogenous characteristics and on endogenous or exogenous market variables, (2) equations of individual behavior in which individual variables about which people do not make decisions, such as their income, are related to the two types of market aggregates, (3) equations of market behavior in which aggregates of the individual variables are related to the market variables, and (4) a block of equations expressing the mechanism through which the endogenous market variables are determined.

So far as I know, no empirical studies of this sort have been made, nor are any likely to be made in the immediate future. A complete model of this sort suggests, however, that many coefficients that have been called income elasticities in the past may not bear much relation to the true coefficients. As of possible academic interest, computed coefficients of income elasticity for many analyses are shown in table 1. Few of these, if any, represent true income elasticities in the Marshallian sense.

Usefulness of Such Studies in Measuring Factors That Influence the Structure of Consumption

How can studies of this sort be used to measure the factors that influence the structure of consumption in the United States or elsewhere? As I stated in the opening paragraph, it is my belief that, particularly for agricultural products, they cannot be of much help. For those industrial products for which production, price, and consumption are simultaneously determined by a common set of economic forces, it is possible that a measurement of the various structural

parameters involved would permit a research worker to measure precisely how consumption would respond to given long-term changes in consumer incomes and other factors. Even here, however, changes in tastes and technological factors probably are far more important in bringing about basic changes in consumption than is the "endogenous mechanism" of the economic variables as such. For agricultural products, consumption in any given year of many products largely is determined by production. Prices move up and down in such a way as to move the supply into available utilization channels. Analyses of the sort described in preceding sections of this paper are invaluable to government administrators and other interested persons in determining probable changes in prices that may result from prospective levels of supply or in determining probable changes in utilization that may result from administratively set levels of prices. They also are used by many individuals, both in and out of government, as means of estimating short term future trends in prices or utilization based on the magnitude of expected supplies and relevant demand shifters. But they are of almost no value in showing <u>why</u> the structure of consumption changes over time.

Sometimes analyses of this sort can be used to show <u>how</u> demand has shifted over time after allowing for the effects of year-to-year variations in the more direct causal variables such as prices and consumer income. If the studies are based on first differences, shifts over time show up in a constant value for the equation that differs significantly from zero. If based on actual data, time may be included as a separate variable. Coefficients that indicate gradual shifts over time in the basic demand relationship are shown wherever possible in table 1. In other cases, changes in structure are suggested by the failure of the analysis to predict the level of prices or consumption. Analyses may break down for other reasons, however, so that the chief conclusion to be drawn from analyses for which this happens is that further research is needed.

As a part of the citrus study referred to on page 9, a real effort is being made to determine why the structure of consumption has changed over time. All of us are aware of the rapid expansion in consumption of frozen concentrated citrus products over the past 10 years or so. Several research studies have shown that to a considerable extent this represents an expansion in the total demand for citrus products rather than a substitution of frozen products for canned or fresh. As the production of citrus fruit is expected to expand rapidly in coming years, the industry is keenly interested in determining why consumption of frozen products has expanded in the past and what can be done to continue the expansion in the future.

Information is available from the Market Research Corporation of America on purchases of a variety of products by weeks for approximately 4,200 families that are assumed to constitute a representative sample throughout the United States. Summary cards showing total purchases of individual citrus products over 4-week periods have been prepared for the Agricultural Marketing Service for the 38 months, August 1949-September 1952. In all, approximately 160,000 observations are available. These are being analyzed to determine (1) the frequency of purchase and average purchases per capita of the various items by regions, income groups, and size of family and (2) family characteristics that appear to result in relatively large purchases of frozen concentrate and total citrus products. Questions the study will attempt to answer include: (1) What is the typical pattern of consumption of frozen juice for a family from the time purchases first start until family consumption levels off on a flat plane, and what happens to consumption of other citrus products; and (2) what part of the rapid increase in consumption of frozen juice represents new consumers and what part represents increased consumption on the part of habitual users? Studies will be made separately for periods in which prices of frozen concentrate declined sharply and of subsequent changes in consumption that took place when prices rose. The study is nearly complete and should be available in published form by around the end of this year.

This appears to be an approach that can be used to show precisely how changes in economic forces affect the basic structure of consumption for particular commodities. Studies of this sort, however, are extremely expensive relative to those based on conventional time series data.

Some Statistical Results

One of the things which I was asked to do in preparing this paper was to review and summarize briefly a number of recent statistical studies in this general area. In preparing this summary, use was made of a summary prepared by Kuznets (21) in 1953. This was brought up-to-date and supplemented by similar studies for additional items, as he included only studies dealing with food products for which results had been obtained by a variety of basic methods. As in his paper, emphasis was placed on statistical analyses based on data for the period between World Wars I and II, although in a few cases analyses that include pre-World War I and/or post-World War II data or that are based only on post-World War II data are shown. For analyses based on data other than logarithms, the coefficients of elasticity were computed based on averages for the period on which the analysis was based. In those cases for which the author gave a number of statistical equations, values shown are based on what he considered the best analysis. In some cases, this value was obtained from the text, so that it may represent a composite of several analyses. As standard errors for the coefficients are not available in published form for many of the studies, they are omitted in all cases. It should be noted that this is not a complete list of recent studies; only those that I happened to know about are included.

Data shown in table 1 for the United Kingdom in all cases were obtained from Stone (29), and those for Sweden were obtained from Wold and Jureen (32). In those cases for which a nearly comparable analysis was run based on data for the United States, the coefficients for the United Kingdom and Sweden are placed on the same line.

Perhaps the only justification for compiling as extensive a table as that shown in table 1 is to permit a comparison of results from alternative methods. Hence as much information as possible relative to methods is shown directly on the table. This is in contrast to the similar table used by Kuznets, where most of the methodological detail was given in footnotes. The following sorts of detail are shown:

1. The level within the marketing system. Separate columns are used for analyses that relate to (1) retail prices and (2) farm or local market prices. The few analyses that relate to wholesale prices are included with those at the local market level, with an appropriate footnote.

2. Whether the analysis was based on least squares or on a system of simultaneous equations. The latter is broken into equations that are just identified and those that are overidentified. In all cases, overidentified equations were fitted by the single equation limited information approach.

3. Whether price and income data were deflated or undeflated. These are indicated, respectively, by use of the terms constant dollars and current dollars

4. The period of years on which the analysis was based.

5. Whether the quantity variable was based on (1) production, (2) aggrega consumption, or (3) purchases of consumers.

6. Whether price or quantity was used as the dependent variable. Where price was taken as dependent, an algebraic transformation was used in deriving the coefficients of elasticity.

7. Whether the analysis was based on data for (1) the United States, (2) the United Kingdom, or (3) Sweden.

Other peculiarities of the studies are indicated by footnote.

I do not propose to discuss these data in any detail, as each of you can analyze them directly from the table. However, I will mention a few highlights.

All analyses for total food, total food-livestock products, and total meat indicate that the elasticity of demand with respect to price is inelastic. The most elastic coefficient for all food at retail is that of -0.81 obtained by Duesenberry and Kistin (7) based on budget data for a variety of years and individual cities. The least elastic coefficients for studies at the retail level in the United States is that of -0.20 obtained by Burk (4) based on least squares. Girshick and Haavelmo (13), in a simultaneous equations analysis, obtained a coefficient of -0.25. Stone reports a figure of -0.35 for the United Kingdom and Wold and Jureen, one of -0.21 for Sweden. Again referring to data for the United States at retail, the least elastic figure for all food-livestock products is -0.52, and for all meat is -0.61, provided a study by French (12) that appears to be out-of-line with all other analyses in this area is omitted. This tends to confirm the commonly held view that elasticity of demand with respect to price tends to become more elastic for less aggregative totals.

For individual meats at retail, the coefficients in general tend to lie close to -1 for the United States, but for the United Kingdom and Sweden they are rather consistently inelastic except in a few minor instances. Coefficients for most other individual food products appear to be inelastic. The only exceptions that appear to be clearly indicated are (1) the long-run demand for beef and for pork obtained by Working (34), (2) the overall demand for beef obtained by Riley in an unpublished study based on post-World War II data from a consumer panel, (3) the demand for ham, pork chops, and steaks as obtained by Riley, (4) the demand for manufactured dairy products excluding butter and cheese obtained by Rojko in an unpublished study based on data for the post-World War II years, and (5) demand for a number of fresh fruits and vegetables as obtained by Fox (10), Foytik (11), and Shuffett (28). As would be expected, the items having the most inelastic demand are bread and flour. Stone found an elasticity of demand of -0.08 for bread at retail in the United Kingdom, and Meinken (24) found a coefficient of -0.04 for wheat for use as food in the United States. In practically

all cases for which comparable analyses are available, demand with respect to price is more inelastic at the wholesale or local market level than at the retail level. Again this is consistent with theoretical expectations.

If any general conclusion can be drawn from these data, it is that despite the diversity of methods, the results are surprisingly uniform and consistent with what would be expected based on theoretical expectations. The use of least squares equations probably is approximately justified for many of these studies, so that the table should not be used as an indication of the degree of closeness in results that can be expected when the method of least squares is used in those cases for which a simultaneous equations approach is clearly preferable.

For the reasons given on page 10, no analysis of the computed coefficients of elasticity of demand with respect to income is given.

SUMMARY

It is my personal belief that time series analyses designed to measure the elasticity of demand with respect to price can tell us little about the economic factors that cause changes in the basic structure of consumption. Such analyses are designed primarily to measure factors that affect prices and consumption from year to year or to obtain estimates of structural coefficients that are useful to government administrators and others as guides to policy decisions with respect to production controls, price support levels, tariffs, freight rates, and related matters. Such analyses may occasionally show <u>how</u> demand has changed over time, chiefly as a byproduct of their basic purpose. Studies currently underway in the Agricultural Marketing Service based on a detailed analysis of data for individual consumers obtained from a consumer panel appear much more promising as a means of obtaining information about how economic variables affect the structure of consumption.

In measuring elasticity coefficients with respect to price from time series data, the approach used is to allow for the effects of major factors other than price and consumption by statistical means and then to find the net relation

between price and consumption. Depending on the circumstances, this may be done by a single equation least squares analysis or by a system of simultaneous equations. Many decisions must be made regarding the exact way in which the data are to be handled, but in general economists and statisticians agree that valid estimates of this coefficient can be obtained provided appropriate statistical methods are used. Except in unusual circumstances, such studies give no indication of how elasticity coefficients differ among various population groups or how they change over time, as the assumption is made in the fitting process that the elasticity as such is invarient.

Econometricians agree less closely on the meaning of income coefficients derived from time series data. Some have argued that these can be obtained only from budget (or consumer panel) data. Others have indicated that even when derived from such data, most studies have not been properly formulated. This is an area where much controversy exists and, until it is cleared up, the interpretation that should be placed on such coefficients as have been obtained in the past will remain indeterminate.

Results from about 200 separate statistical analyses are given in table 1. Studies are included for the United States, the United Kingdom, and Sweden. In general these indicate that elasticity of demand with respect to price is inelastic for all food, total food-livestock products, total meat, and most individual foods other than meat, certain manufactured dairy products, and certain fresh fruits and vegetables. Demand for individual meats at retail is close to unity with the exception of all beef, steaks, ham, and pork chops, where demand appears to be clearly elastic. The long-run demand for pork may be elastic. Demand for ice cream, as a major component of the manufactured dairy products total mentioned above, and for some fruits and vegetables, also appears to be clearly elastic. Demand for nondurable goods other than food, such as alcoholic beverages, tobacco products, apparel, and mill consumption of cotton, all appear to be inelastic. Although these analyses were handled statistically by a wide variety of methods, the results are surprisingly uniform and in general are consistent with theoretical expectations.

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Agriculture-Washington

Table 1.- Elasticities of demand for nondurable consumer goods

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail level: Price: United States	Retail level: Price: United Kingdom	Retail level: Price: Sweden	Retail level: Income: Current: United States	Retail level: Income: Current: United Kingdom	Retail level: Income: Current: Sweden	Retail level: Income: Lagged, United States	Retail level: Time, United States	Farm level, United States: Price	Farm level, United States: Income	Farm level, United States: Time
All food:															
Burk: (4)															
Least squares:															
Logarithms	Current	1922-41	Cons.	Cons.	-0.20	---	---	0.24	---	---	---	---	---	---	---
Do.	do.	do.	do.	Price	-.29	---	---	.30	---	---	---	---	---	---	---
Cochrane: (5)															
Least squares:															
Actual data	do.	do.	do.	Cons.	-.41	---	---	---	---	---	---	---	---	---	---
Cochrane and Lampe: (6)															
Least squares:															
Actual data	do.	1929-42; 1947-49	do.	do.	-.24	---	---	---	---	---	---	---	---	---	---
Duesenberry and Kistin: (7)															
Least squares:															
Logarithms	Constant	1918-47	do.	do.	-.81	---	1/-0.21	---	---	1/0.28	---	---	---	---	---
Girshick and Haavelmo: (13)															
Overidentified:															
Actual data	do.	1922-41	do.	---	-.25	---	---	.25	---	---	0.05	---	-0.08	---	---
Least squares:															
Actual data	do.	do.	do.	Cons.	-.34	---	---	.27	---	---	.06	---	---	---	---
Do.	do.	do.	do.	Price	-.53	---	---	.33	---	---	.07	---	---	---	---
Logarithms	do.	do.	do.	Cons.	-.37	---	---	.28	---	---	.05	---	---	---	---
Do.	do.	do.	do.	Price	-.56	---	---	.34	---	---	.05	---	---	---	---
Δ logarithms	do.	do.	do.	Cons.	-.32	2/-0.35	---	.26	2/0.53	---	.01	---	---	---	---
Do.	do.	do.	do.	Price	-.61	---	---	.37	---	---	.02	---	---	---	---
Shores: 3/															
Overidentified:															
Actual data	do.	do.	do.	---	-.36	---	---	.04	---	---	.44	---	-.22	---	---
Tobin: (31)															
Least squares:															
Logarithms 4/	do.	1913-41	do.	Price	-.53	---	---	.45	---	---	.11	---	---	---	---
Do. 5/	do.	do.	do.	do.	-.28	---	---	.27	---	---	---	---	---	---	---
Food-livestock products:															
Fox: (10)															
Least squares:															
Δ logarithms	Current	1922-41	do.	Cons.	-.56	---	---	.47	---	---	---	---	---	---	---
Do.	Constant	do.	do.	do.	-.52	---	---	.40	---	---	---	---	---	---	---
Do.	Current	do.	do.	Price	-.61	---	---	.51	---	---	---	---	-.41	0.50	---
Hildreth and Jarrett: (16)															
Overidentified:															
Actual data	do.	1920-49	do.	---	---	---	---	---	---	---	---	---	-.89	.78	---
Logarithms	do.	do.	do.	---	---	---	---	---	---	---	---	---	-.76	.75	---

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail: Price: United States	Retail: Price: United Kingdom	Retail: Price: Sweden	Retail: Income: Current: United States	Retail: Income: Current: United Kingdom	Retail: Income: Current: Sweden	Retail: Income: Lagged, United States	Retail: Time, United States	Farm level, United States: Price	Farm level, United States: Income	Farm level, United States: Time
Least squares:															
Actual data	Current	1920-49	Cons.	Cons.	---	---	---	---	---	---	---	---	-.95	.83	---
Logarithms	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.76	.75	---
Wold and Jureen: (32)															
Least squares:															
Logarithms	Constant	1921-39	do.	do.	---	---	-0.37	---	---	0.24	---	---	---	---	---
All meat:															
Fox: (10)															
Least squares:															
Δ logarithms	Current	1922-41	do.	do.	-.64	---	---	.56	---	---	---	---	---	---	---
Do.	Constant	do.	do.	do.	-.62	---	---	.51	---	---	---	---	---	---	---
Do.	Current	do.	do.	Price	-.67	---	---	.58	---	---	---	---	---	---	---
Do.	do.	do.	Prod.	do.	-.93	---	---	.80	---	---	---	---	-.62	.89	---
French: (12)															
Overidentified:															
Actual data	do.	1919-41	Cons.	---	-.24	---	---	.50	---	---	---	---	---	---	---
Least squares:															
Actual data	do.	do.	do.	Cons.	-.45	---	---	.53	---	---	---	---	---	---	---
Do.	do.	do.	do.	Price	-.71	---	---	.58	---	---	---	---	---	---	---
Riley: 6/															
Least squares:															
Actual data	do.	July 1951-June 1953	Pur.	Pur.	-.73	---	---	---	---	---	---	---	---	---	---
Shepherd: (27)															
Least squares:															
Actual data	do.	1920-41	Cons.	Price	-.74	---	---	.58	---	---	---	.07	---	---	---
Tintner: (30)															
Just identified:															
Actual data	Constant	1919-41	do.	---	-.79	---	----	.56	---	---	---	---	---	---	---
Weighted regression:															
Actual data	do.	do.	do.	Cons.	-.82	---	---	.59	---	---	---	---	---	---	---
Working: (33)															
Overidentified:															
Actual data	do.	1922-41	do.	---	-.63	---	---	.44	---	---	---	---	---	---	---
Least squares:															
Actual data	do.	do.	do.	Cons.	-.61	---	---	.46	---	---	---	---	---	---	---
Logarithms:....															
Long run	do.	do.	do.	Price	-.99	---	---	.54	---	---	---	---	---	---	---
Short run	do.	do.	do.	do.	-.78	---	---	.43	---	---	---	---	---	---	---
Beef:															
Fox: (10)															
Least squares:															

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail level: Price: United States	Price: United Kingdom	Price: Sweden	Income: Current: United States	Income: Current: United Kingdom	Income: Current: Sweden	Income: Lagged, United States	Time, United States	Farm level, United States: Price	Farm level: Income	Farm level: Time
Δ logarithms	Current	1922-41	Cons.	Cons.	-.79	---	---	.73	---	---	---	---	---	---	---
Do.	do.	do.	do.	Price	-.94	---	---	.83	---	---	---	---	---	---	---
Do.	do.	do.	Prod.	do.	7/-1.03	---	---	.92	---	---	---	---	-.84	1.07	---
Nordin, Judge, and Wahby: (25)															
Overidentified:															
Logarithms	Constant	do.	Cons.	---	-3.23	---	---	-.63	---	---	-.10	.020	---	---	---
Just identified:															
Logarithms	do.	do.	do.	---	-.77	---	---	.65	---	---	-.12	-.003	---	---	---
Least squares:															
Logarithms	do.	do.	do.	Cons.	-.96	---	1/-.50	.33	---	1/.30	-.40	.001	---	---	---
Riley: 6/															
Least squares:															
Actual data	Current	July 1951-Dec. 1952	Pur.	Pur.	-1.11	---	---	.30	---	---	---	---	---	---	---
Do.	do.	July 1952-June 1953	do.	do.	-.94	---	---	---	---	---	---	---	---	---	---
First differences	do.	do.	do.	do.	-.75	---	---	---	---	---	---	---	---	---	---
Working: (33)															
Least squares:															
Long run	Constant	1922-41	Cons.	---	8/-1.4	---	---	---	---	---	---	---	---	---	---
Short run	do.	do.	do.	---	8/-.9	---	---	---	---	---	---	---	---	---	---
Pork:															
Fox: (10)															
Least squares:															
Δ logarithms	Current	do.	do.	Cons.	-.81	2/-.67	---	.72	2/.58	---	---	---	---	---	---
Do.	do.	do.	do.	Price	-.86	---	---	.78	---	---	---	---	---	---	---
Do.	do.	do.	Prod.	do.	-1.18	---	---	1.09	---	---	---	---	---	---	---
Nordin, Judge, and Wahby: (25)															
Overidentified:															
Logarithms	Constant	1921-41	Cons.	---	-.81	---	---	-.40	---	---	.26	.020	---	---	---
Just identified:															
Logarithms	do.	do.	do.	---	-.91	---	---	.76	---	---	.29	-.004	---	---	---
Least squares:															
Logarithms	do.	do.	do.	Cons.	-.78	---	1/-.45	.43	---	1/.33	.22	-.001	---	---	---
Riley: 6/															
Least squares:															
Actual data	Current	July 1951-Dec. 1952	Pur.	Pur.	-1.35	---	---	9/	---	---	---	---	---	---	---
Do.	do.	July 1952-June 1953	do.	do.	-1.25	---	---	9/	---	---	---	---	---	---	---
Working: (33)															
Least squares:															
Logarithms:															
Long run	Constant	1922-41	Cons.	Price	-1.55	---	---	.75	---	---	---	---	---	---	---
Short run	do.	do.	do.	do.	-.99	---	---	.48	---	---	---	---	---	---	---

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail								Farm level, United States		
					Price			Income				Time, United States			
								Current			Lagged, United States				
					United States	United Kingdom	Sweden	United States	United Kingdom	Sweden			Price	Income	Time
Lamb:															
Fox: (10)															
Least squares:															
Δ logarithms	Current	1922-41	Cons.	Cons.	10/-.91	---	---	.65	---	---	---	---	---	---	---
Do	do.	do.	Prod.	Price	---	---	---	---	---	---	---	---	-.67	.73	---
Mutton and lamb:															
Stone: (29)															
Least squares:															
Δ logarithms:															
Home produced	Constant	1920-38	Cons.	Cons.	---	-1.47	---	---	.70	---	---	---	---	---	---
Imported	do.	do.	do.	do.	---	-.82	---	---	.70	---	---	---	---	---	---
Veal:															
Fox: (10)															
Least squares:															
Δ logarithms	Current	1922-41	Prod.	Price	---	---	---	---	---	---	---	---	-1.22	1.58	---
Beef and veal:															
Stone: (29)															
Least squares:															
Δ logarithms:															
Home produced	Constant	1920-38	Cons.	Cons.	---	-.41	---	---	.34	---	---	---	---	---	---
Imported	do.	do.	do.	do.	---	-.55	---	---	.34	---	---	---	---	---	---
Pork chops:															
Riley: 6/															
Least squares:															
Actual data	Current	July 1952-June 1953	Pur.	Pur.	-1.33	---	---	---	---	---	---	---	---	---	---
Bacon:															
Riley: 6/															
Least squares:															
Actual data	do.	do.	do.	do.	-.75	---	---	---	---	---	---	---	---	---	---
Ham:															
Riley: 6/															
Least squares:															
Actual data	do.	do.	do.	do.	-1.36	---	---	---	---	---	---	---	---	---	---
Bacon and ham:															
Stone: (29)															
Least squares:															
Δ logarithms	Constant	1920-38	Cons.	Cons.	---	-.88	---	---	.55	---	---	---	---	---	---
Ground beef:															
Riley: 6/															
Least squares:															
Actual data	Current	July 1952-June 1953	Pur.	Pur.	Inelastic 8/	---	---	---	---	---	---	---	---	---	---

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail: Price: United States	Retail: Price: United Kingdom	Retail: Price: Sweden	Retail: Income: Current: United States	Retail: Income: Current: United Kingdom	Retail: Income: Current: Sweden	Retail: Income: Lagged, United States	Retail: Time, United States	Farm level, United States: Price	Farm level, United States: Income	Farm level, United States: Time
Roasts:															
Riley: 6/															
Least squares:															
Actual data	Current	July 1952-June 1953	Pur.	Pur.	Slightly elastic 8/	---	---	---	---	---	---	---	---	---	---
Steaks:															
Riley: 6/															
Least squares:															
Actual data	do.	do.	do.	do.	Highly elastic 8/	---	---	---	---	---	---	---	---	---	---
Canned meat:															
Stone: (29)															
Least squares:															
Δ logarithms															
Imported	Constant	1920-38	Cons.	Cons.	---	-1.09	---	---	.27	---	---	---	---	---	---
Poultry:															
Nordin, Judge, and Wahby: (25)															
Overidentified:															
Logarithms	do.	1921-41	do.	---	2.28	---	---	1.59	---	---	.27	-.020	---	---	---
Just identified:															
Logarithms	do.	do.	do.	---	-.68	---	---	.53	---	---	.28	.000	---	---	---
Least squares:															
Logarithms	do.	do.	do.	Cons.	-.46	---	---	.74	---	---	.51	-.003	---	---	---
Stone: (29)															
Least squares:															
Δ logarithms	do.	1920-38	do.	do.	---	-.27	---	---	1.17	---	---	---	---	---	---
Chickens:															
Fox: (10)															
Least squares:															
Δ logarithms	Current	1922-41	do.	Price	13/-1.15	---	---	1.01	---	---	---	---	---	---	---
Do.	do.	do.	Prod.	do.	---	---	---	---	---	---	---	---	10/-1.61	1.71	---
Turkeys:															
Fox: (10)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.75	.88	---
Eggs:															
Fox: (10)															
Least squares:															
Δ logarithms	do.	do.	Cons.	do.	12/-.43	---	---	.57	---	---	---	---	---	---	---
Do.	do.	do.	Prod.	do.	---	---	---	---	---	---	---	---	12/-.34	.49	---
Judge: (18)															
Overidentified:															
Logarithms	Constant	do.	Cons.	---	-.58	---	---	.44	---	---	.29	-.040	---	---	---

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail level: Price: United States	Retail level: Price: United Kingdom	Retail level: Price: Sweden	Retail level: Income: Current: United States	Retail level: Income: Current: United Kingdom	Retail level: Income: Current: Sweden	Retail level: Income: Lagged, United States	Retail level: Time, United States	Farm level, United States: Price	Farm level, United States: Income	Farm level, United States: Time
Just identified:															
Logarithms	Constant	1922-41	Cons.	---	-.29	---	---	.35	---	---	.30	-.004	---	---	---
Least squares:															
Logarithms	do.	do.	do.	Cons.	-.53	---	1/8/-1.00	.31	---	1/8/.70	.22	-.010	---	---	---
Nordin, Judge, and Wahby: (25)															
Overidentified:															
Logarithms	do.	do.	do.	---	-.58	---	---	.44	---	---	.29	.040	---	---	---
Least squares:															
Logarithms	do.	do.	do.	Cons.	-.55	---	---	.41	---	---	.27	-.020	---	---	---
Stone: (29)															
Least squares:															
Δ logarithms	do.	1920-38	do.	do.	---	-.43	---	---	.54	---	---	---	---	---	---
Fish:															
Stone: (29)															
Least squares:															
Δ logarithms:															
Fresh	do.	do.	do.	do.	---	-.57	---	---	.92	---	---	---	---	---	---
Cured	do.	do.	do.	do.	---	-.65	---	---	.76	---	---	---	---	---	---
Fresh and cured	do.	do.	do.	do.	---	-.74	---	---	.88	---	---	---	---	---	---
All manufactured dairy products:															
Rojko: (26)															
Just identified:															
Actual data	Current	1924-41	do.	---	-1.81	---	---	1.09	---	---	---	---	---	---	---
Do.	Constant	do.	do.	---	-1.31	---	---	.43	---	---	---	---	---	---	---
First differences	Current	do.	do.	---	-1.48	---	---	.87	---	---	---	---	---	---	---
Do.	Constant	do.	do.	---	-1.42	---	---	.53	---	---	---	---	---	---	---
Milk and cream:															
Rojko: (26)															
Just identified:															
Actual data	do.	do.	do.	---	-.48	---	---	.17	---	---	---	---	---	---	---
Actual data and first differences 13/	do.	do.	do.	---	-.34	---	---	.16	---	---	---	---	---	---	---
Rojko: 14/															
Overidentified:															
First differences	Current	1947-54	do.	---	-.32	---	---	.27	---	---	---	---	---	---	---
Wold and Jureen: (32)															
Least squares:															
Logarithms	Constant	1921-39	do.	Cons.	---	---	8/-.30	---	---	8/.10	---	---	---	---	---
Milk:															
Stone: (29)															
Least squares:															
Δ logarithms:															
Fresh	do.	1920-38	do.	do	---	-.49	---	---	.50	---	---	---	---	---	---
Condensed	do.	do.	do.	do.	---	-1.23	---	---	-.53	---	---	---	---	---	---

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail: Price: United States	Retail: Price: United Kingdom	Retail: Price: Sweden	Retail: Income: Current: United States	Retail: Income: Current: United Kingdom	Retail: Income: Current: Sweden	Retail: Income: Lagged, United States	Retail: Time, United States	Farm level, United States: Price	Farm level, United States: Income	Farm level, United States: Time
Cream:															
Stone: (29)															
Least squares:															
Δ logarithms	Constant	1920-38	Cons.	Cons.	---	-.69	---	---	1.71	---	--	---	---	---	---
Butter:															
Rojko: (26)															
Just identified:															
Actual data	do.	1924-41	do.	--	- 39	---	--	.19	--	---	---	---	---	---	---
First differences	do.	do.	do	---	- 62	---	--	.37	--	---	---	---	---	---	---
Rojko: 14/															
Overidentified:															
Actual data:															
First differences	Current	1947-54	do.	---	-1.37	---	---	.36	---	---	---	---	---	---	---
Stone: (29)															
Least squares:															
Δ logarithms	Constant	1920-38	do.	Cons.	---	-.41	---	---	.37	---	---	---	---	---	---
Wold and Jureen: (32)															
Least squares:															
Logarithms	do.	1926-39	do.	do.	---	---	8/-.90	---	---	8/.55	---	---	---	---	---
Margarine:															
Rojko: 14/															
Overidentified:															
First differences	Current	1947-54	do.	---	-.25	---	---	1.81	---	---	---	---	---	---	---
Stone: (29)															
Least squares:															
Δ logarithms	Constant	1921-38	do.	Cons.	---	.01	---	---	-.16	---	---	---	---	---	---
Butter and margarine:															
Wold and Jureen: (32)															
Least squares:															
Logarithms	do.	1921-39	do.	do.	---	---	8/-.50	---	---	8/ 50	---	---	---	---	---
Manufactured dairy products excluding butter:															
Rojko: (26)															
Just identified:															
Actual data	do.	1924-41	do.	---	-2.16	---	---	1.16	---	---	---	---	---	---	---
First differences	do.	do.	do.	---	-2.00	---	---	1.00	---	---	---	---	---	---	---
Cheese:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	1920-38	do.	Cons.	---	15/	---	---	.21	---	---	---	---	---	---
Wold and Jureen: (32)															
Least squares:															
Logarithms	do.	1921-39	do.	do.	---	---	8/-.20	---	---	8/.50	---	---	---	---	---

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail level: Price: United States	Retail level: Price: United Kingdom	Retail level: Price: Sweden	Retail level: Income: Current: United States	Retail level: Income: Current: United Kingdom	Retail level: Income: Current: Sweden	Retail level: Income: Lagged, United States	Retail level: Time, United States	Farm level, United States: Price	Farm level, United States: Income	Farm level, United States: Time
American cheese:															
Rojko: 14/															
Overidentified:															
First differences	Current	1947-54	Cons.	---	-.75	---	---	-.99	---	---	---	---	---	---	---
Manufactured dairy products, excluding butter and cheese:															
Rojko: 14/															
Overidentified:															
First differences	do.	do.	do.	---	-1.47	---	---	3.06	---	---	---	---	---	---	---
Lard:															
Stone: (29)															
Least squares:															
Δ logarithms	Constant	1920-38	do.	Cons.	---	-.60	---	---	-.09	---	---	---	---	---	---
Peanuts:															
Banna, Armore, and Foote: (2) 16/															
Least squares:															
Logarithms:		1920-40													
Cleaned	Current	1946-50	do.	do.	---	---	---	---	---	---	---	---	-.28	.61	-.03
Shelled	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.38	.44	-.03
Δ logarithms:															
Shelled	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.51	.61	---
Food fats and oils, excluding butter and lard:															
Armore: (1) 16/															
Least squares:		1922-42													
Logarithms	do.	1947-51	Supply	Price	---	---	---	---	---	---	---	---	-.75	.96	---
Apples:															
Fox: (10)															
Least squares:															
Δ logarithms	do.	1922-41	Prod.	do.	---	---	---	---	---	---	---	---	-1.27	1.32	---
Stone: (29)															
Least squares:															
Δ logarithms:															
Home produced	Constant	1920-38	Cons.	Cons.	---	-1.67	---	---	1.33	---	---	---	---	---	---
Imported	do.	do.	do.	do.	---	-.59	---	---	1.33	---	---	---	---	---	---
Peaches:															
Fox: (10)															
Least squares:															
Δ logarithms	Current	1922-41	Prod.	Price	---	---	---	---	---	---	---	---	-1.49	1.43	---
Cranberries:															
Fox: (10)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.67	.52	---

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail: Price: United States	Retail: Price: United Kingdom	Retail: Price: Sweden	Retail: Income: Current: United States	Retail: Income: Current: United Kingdom	Retail: Income: Current: Sweden	Retail: Income: Lagged, United States	Retail: Time, United States	Farm level, United States: Price	Farm level, United States: Income	Farm level, United States: Time
All deciduous fruits:															
Fox: (10)															
Least squares:															
Δ logarithms	Current	1922-41	Prod.	Price	---	---	---	---	---	---	---	---	-1.47	1.59	---
Oranges:															
Fox: (10)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.62	.83	---
Stone: (29)															
Least squares:															
Logarithms	Constant	1920-38	Cons.	Cons.	---	-.97	---	---	.92	---	---	---	---	---	---
Grapefruit:															
Fox: (10)															
Least squares:															
Δ logarithms	Current	1922-41	Prod.	Price	---	---	---	---	---	---	---	---	-.56	.73	---
Lemons:															
Fox: (10)															
Least squares:															
Δ logarithms															
Shipped fresh:															
Summer	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.40	.43	---
Winter	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.72	---	---
All	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.59	.46	---
All citrus fruits:															
Fox: (10)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.76	.74	---
Bananas:															
Stone: (29)															
Least squares:															
Δ logarithms	Constant	1920-38	Cons.	Cons.	---	-.89	---	---	.95	---	---	---	---	---	---
Plums:															
Foytik: (11) 16/															
Least squares:															
Actual data:															
Variety:															
Early	Current	1922-47 excl. 1943-45	Auction sales	Price	---	---	---	---	---	---	---	---	-2.84	2.64	---
Midseason	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-1.25	.97	-0.01
Late	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-3.00	1.52	---
Week:															
2	do.	1928-48 excl. 1943-45	do.	do.	---	---	---	---	---	---	---	---	-17.48	10.00	---
7	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-2.50	1.64	---
16	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-15.62	5.20	---

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail level: Price: United States	Retail level: Price: United Kingdom	Retail level: Price: Sweden	Retail level: Income: Current: United States	Retail level: Income: Current: United Kingdom	Retail level: Income: Current: Sweden	Retail level: Income: Lagged, United States	Retail level: Time, United States	Farm level, United States: Price	Farm level, United States: Income	Farm level, United States: Time
Miscellaneous fresh fruits and nuts:															
Stone: (29)															
Least squares:															
Δ logarithms	Constant	1920-38	Cons.	Cons.	---	-.94	---	---	1.62	---	---	---	---	---	---
Canned and bottled fruit:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	-.42	---	---	1.34	---	---	---	---	---	---
Dried fruit:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	-.26	---	---	.75	---	---	---	---	---	---
Potatoes:															
Shuffett: (28)															
Least squares:															
Δ logarithms:															
Early commercial	Current	1921-41	Prod.	Price	---	---	---	---	---	---	---	---	-.47	.46	---
Late surplus	do.	do.	do.	do.	-.40	---	---	---	---	---	---	---	-.25	.35	---
Total	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.28	.42	---
Stone: (29)															
Least squares:															
Δ logarithms:															
Home produced	Constant	1920-38	Cons.	Cons.	---	-.56	---	---	.21	---	---	---	---	---	---
Imported	do.	do.	do.	do.	---	-1.32	---	---	.21	---	---	---	---	---	---
Sweetpotatoes:															
Fox: (10)															
Least squares:															
Δ logarithms	Current	1922-41	Prod.	Price	---	---	---	---	---	---	---	---	-1.30	1.16	---
Onions:															
Shuffett: (28)															
Least squares:															
Δ logarithms:															
Late	do.	1921-41	do.	do.	8/-.70	---	---	---	---	---	---	---	-.35	.55	---
Total	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.45	.50	---
Cabbage:															
Shuffett: (28)															
Least squares:															
Δ logarithms:															
Fall	do.	do.	do.	do.	Elastic 8/	----	---	---	---	---	---	---	-.51	.79	---
Total	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.42	.48	---
Peas:															
Shuffett: (28)															
Least squares:															
Δ logarithms:															
Fresh market (including frozen)	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-2.83	1.05	---
For processing	do.	do.	Supply	do.	---	---	---	---	---	---	---	---	-1.60	.96	---
Logarithms			Monthly unloads,												
Fresh market (including frozen) 15/	do.	1934-41	Chicago	do.	---	---	---	---	---	---	---	---	-2.20	---	---

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail: Price: United States	Retail: Price: United Kingdom	Retail: Price: Sweden	Retail: Income: Current: United States	Retail: Income: Current: United Kingdom	Retail: Income: Current: Sweden	Retail: Income: Lagged, United States	Retail: Time, United States	Farm level, United States: Price	Farm level, United States: Income	Farm level, United States: Time
Lettuce:															
Shuffett: (28)															
Least squares:															
Δ logarithms	Current	1921-41	Prod.	Price	---	---	---	---	---	---	---	---	-2.58	.88	---
Do.	do.	do.	do.	do.	---	---	---	---	---	---	---	---	12/ -2.56	12/ .87	---
Tomatoes:															
Shuffett: (28)															
Overidentified:															
Δ logarithms:															
Winter quarter	do.	1925-41	do.	do.	---	---	---	---	---	---	---	---	-2.22	.24	---
Least squares:															
Δ logarithms:															
Fresh	do.	1921-41	do.	do.	---	---	---	---	---	---	---	---	-4.65	3.66	---
Canned	do.	1921-52	Cons.	Cons.	-.40	---	---	.22	---	---	---	---	---	---	---
Root vegetables, tomatoes, etc.:															
Stone: (29)															
Least squares:															
Δ logarithms	Constant	1920-38	do.	do.	---	-.19	---	---	.85	---	---	---	---	---	---
Fresh green vegetables and legumes:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	-.31	---	---	.93	---	---	---	---	---	---
Dried legumes:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	-1.58	---	---	.18	---	---	---	---	---	---
Canned and bottled vegetables:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	-1.08	---	---	.70	---	---	---	---	---	---
Truck crops for fresh market:															
Fox: (10)															
Least squares:															
Δ logarithms															
Winter	Current	1928-41	Prod.	Price	---	---	---	---	---	---	---	---	10/ -.88	.81	---
Spring	do.	do.	do.	do.	---	---	---	---	---	---	---	---	10/ -1.05	.66	---
Summer	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.58	.72	---
Fall	do.	do.	do.	do.	---	---	---	---	---	---	---	---	-.60	.51	---
Calendar year	do.	do.	do.	do.	---	---	---	---	---	---	---	---	10/ -.97	.79	---
Miscellaneous vegetable products:															
Wold and Jureen: (32)															
Least squares:															
Logarithms	Constant	1921-39	Cons.	Cons.	---	---	-.11	---	---	-.12	---	---	---	---	---
Sugar:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	1921-38	do.	do.	---	-.44	---	---	.09	---	---	---	---	---	---

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail: Price: United States	Retail: Price: United Kingdom	Retail: Price: Sweden	Retail: Income: Current: United States	Retail: Income: Current: United Kingdom	Retail: Income: Current: Sweden	Retail: Income: Lagged, United States	Retail: Time, United States	Farm level, United States: Price	Farm level, United States: Income	Farm level, United States: Time
Sugar and syrup:															
Wold and Jureen: (32)															
Least squares:															
Logarithms	Constant	1921-38	Cons.	Cons.	---	---	8/-.30	---	---	8/.40	---	---	---	---	---
Chocolate and sugar confectionary:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	-.53	---	---	.22	---	---	---	---	---	---
Bread:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	1920-38	do.	do.	---	-.08	---	---	-.05	---	---	---	---	---	---
Cakes and biscuits:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	-.74	---	---	.73	---	---	---	---	---	---
Bakery products:															
Meinken: (24)															
Least squares:															
Actual data	Current	1923-47	do.	do.	-.60	---	---	.40	---	---	---	---	---	---	---
Miscellaneous cereals:															
Stone: (29)															
Least squares:															
Δ logarithms	Constant	1920-38	do.	do.	---	-.09	---	---	.49	---	---	---	---	---	---
Flour:															
Stone: (29)															
Least squares:															
logarithms	do.	do.	do.	do.	---	-.79	---	---	-.15	---	---	---	---	---	---
Wold and Jureen: (32)															
Least squares:															
Logarithms	do.	1921-39	do.	do.	---	---	In-elastic 8/	---	---	8/-.60	---	---	---	---	---
Wheat for food:															
Meinken: (24) 16/															
Overidentified:															
Actual data	Current	1921-29 1931-38	do.	---	---	---	---	---	---	---	---	---	-.04	.20	---
Least squares:															
Actual data	do.	do.	do.	Cons.	---	---	---	---	---	---	---	---	-.04	.20	---
Tea:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	1920-38	do.	do.	---	-.26	---	---	.04	---	---	---	---	---	---
Cocoa:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	15/	---	---	-.10	---	---	---	---	---	---
Beer:															
Stone: (29)															
Least squares:															
Δ logarithms	Constant	do.	do.	do.	---	-.87	---	---	-.05	---	---	---	---	---	---

Continued -

Table 1.- Elasticities of demand for nondurable consumer goods - Continued

Item	Type of dollars	Period	Quantity measure	Dependent variable	Retail level								Farm level, United States		
								Income							
								Current			Lagged, United States	Time, United States	Price	Income	Time
					United States	United Kingdom	Sweden	United States	United Kingdom	Sweden					
Spirits:															
Stone: (29)															
Least squares:															
Δ logarithms	Constant	1920-38	Cons.	Cons.	---	-.57	---	---	.60	---	---	---	---	---	---
Wine:															
Stone: (29)															
Least squares:															
Δ logarithms:															
Imported	do.	do.	do.	do.	---	-.60	---	---	1.40	---	---	---	---	---	---
British	do.	1927-38	do.	do.	---	-.31	---	---	1.70	---	---	---	---	---	---
Cigarettes:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	1920-38	do.	do.	---	-.39	---	---	.22	---	---	---	---	---	---
Other tobacco products:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	-.40	---	---	1.50	---	---	---	---	---	---
All tobacco:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	-.27	---	---	.25	---	---	---	---	---	---
Drink and tobacco:															
Stone: (29)															
Least squares:															
Δ logarithms	do.	do.	do.	do.	---	-.74	---	---	.20	---	---	---	---	---	---
Apparel:															
Hermie: (16)															
Least squares:															
Actual data	do.	1929-39	Expenditures	Expenditures	15/	---	---	1.07	---	---	---	---	---	---	---
Δ logarithms	do.	do.	do.	do.	15/	---	---	.99							
Cotton:															
Lowenstein and Simon: (23) 16/															
Least squares:															
Logarithms	do.	1921-40 1947-50	Mill cons.	Mill cons.	---	---	---	---	---	---	---	---	-.24	17/1.71	---

1/ Derived from a similar analysis by Wold and Jureen (32). 2/ Derived from a similar analysis by Stone (29). 3/ Shores, Lois Nelson, "A System of Structural Equations Explaining the Demand for Food in the United States," unpublished M. A. Thesis, Univ. of Chicago, 1946. 4/ Estimates were obtained under the restriction that the sum of current and lagged income elasticities is 0.56. 5/ Estimates were obtained with no restriction. 6/ Riley, Harold M. "Some Measurements of Consumer Demand for Meats," unpublished Ph.D. Thesis, Michigan State College, 1954. 7/ Elasticity is based on a regression coefficient revised after publication. 8/ Elasticity reflects author's judgment of the coefficient. 9/ Regression coefficient is given in the original article. This could not be converted to an elasticity as neither the mean nor the original series was shown. 10/ Author notes that coefficient on which elasticity is based probably understates the true effect. 11/ Elasticity is based on a weighted regression allowing for errors in all variables and forcing a reversible (unique) demand function. 12/ Elasticity is based on a regression that allows for direct estimate of the level of measurement error in all variables, but without forcing a reversible (unique) demand function. 13/ Price equation analyzed in actual data; quantity equation in first differences of actual data. 14/ Rojko, Anthony S. "Demand and Price Structure for Dairy Products." Unpublished manuscript. 15/ Analysis indicated a statistically-nonsignificant positive relation to price. 16/ Price data relate to wholesale markets. 17/ Income elasticity derived from the combined effect of deflated disposable income per capita, and its change from the preceding year.